

# HD14174B

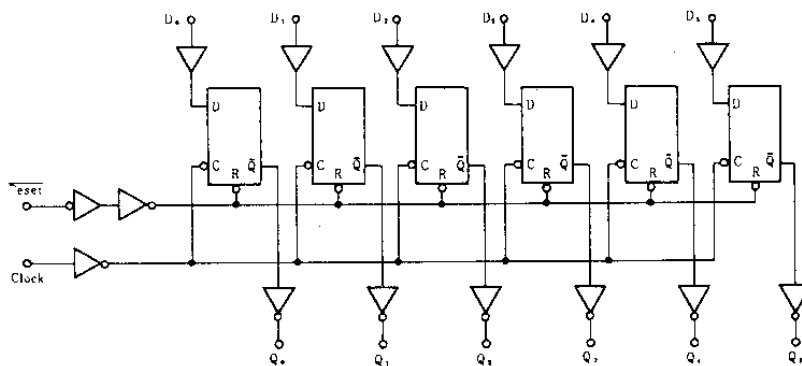
## Hex D-type Flip Flop

The HD14174B is hex type D flip-flop. Data on the D inputs which meets the setup time requirements is transferred to the Q outputs on the positive edge of the clock pulse. All six flip-flops share common clock and reset inputs. The reset is active low, and independent of the clock.

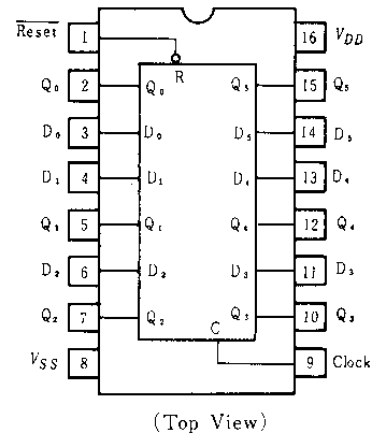
### FEATURES

- Supply Voltage Range = 3 to 18V
- Noise Immunity = 45% of  $V_{DD}$  typ.
- Output Compatible with One Low-power Schottky TTL Load
- Functional Equivalent to TTL 74174

### BLOCK DIAGRAM



### PIN ARRANGEMENT

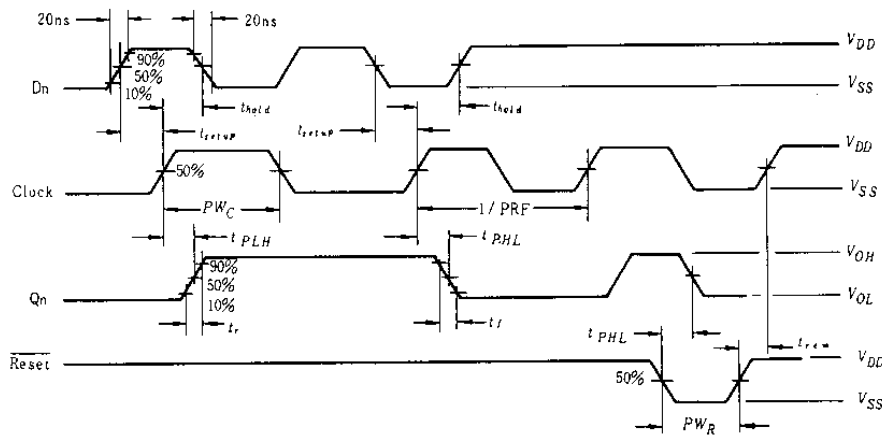


### TRUTH TABLE

Inputs			Output
Clock	Data	Reset	Q
	0	1	0
	1	1	1
	x	1	Q
x	x	0	0

x = Don't Care

### DYNAMIC SIGNAL WAVEFORMS



**ELECTRICAL CHARACTERISTICS**

Characteristic	Symbol	$V_{DD}$ (V)	Test Conditions	-40°C		25°C			85°C		Unit
				min	max	min	typ	max	min	max	
Output Voltage	$V_{OL}$	5.0	$V_{in} = V_{DD}$ or 0	-	0.05	-	0	0.05	-	0.05	V
		10		-	0.05	-	0	0.05	-	0.05	
		15		-	0.05	-	0	0.05	-	0.05	
	$V_{OH}$	5.0	$V_{in} = 0$ or $V_{DD}$	4.95	-	4.95	5.0	-	4.95	-	V
		10		9.95	-	9.95	10	-	9.95	-	
		15		14.95	-	14.95	15	-	14.95	-	
Input Voltage	$V_{IL}$	5.0	$V_{out} = 4.5$ or $0.5$ V	-	1.5	-	2.25	1.5	-	1.5	V
		10	$V_{out} = 9.0$ or $1.0$ V	-	3.0	-	4.50	3.0	-	3.0	
		15	$V_{out} = 13.5$ or $1.5$ V	-	4.0	-	6.75	4.0	-	4.0	
	$V_{IH}$	5.0	$V_{out} = 0.5$ or $4.5$ V	3.5	-	3.5	2.75	-	3.5	-	V
		10	$V_{out} = 1.0$ or $9.0$ V	7.0	-	7.0	5.50	-	7.0	-	
		15	$V_{out} = 1.5$ or $13.5$ V	11.0	-	11.0	8.25	-	11.0	-	
Output Drive Current	$I_{OH}$	5.0	$V_{OH} = 2.5$ V	-2.5	-	-2.1	-4.2	-	-1.7	-	mA
		5.0	$V_{OH} = 4.6$ V	-0.52	-	-0.44	-0.88	-	-0.36	-	
		10	$V_{OH} = 9.5$ V	-1.3	-	-1.1	-2.25	-	-0.9	-	
		15	$V_{OH} = 13.5$ V	-3.6	-	-3.0	-8.8	-	-2.4	-	
	$I_{OL}$	5.0	$V_{OL} = 0.4$ V	0.52	-	0.44	0.88	-	0.36	-	mA
		10	$V_{OL} = 0.5$ V	1.3	-	1.1	2.25	-	0.9	-	
15		$V_{OL} = 1.5$ V	3.6	-	3.0	8.8	-	2.4	-		
Input Current	$I_{in}$	15		-	$\pm 0.3$	-	$\pm 0.0001$	$\pm 0.3$	-	$\pm 1.0$	$\mu$ A
Input Capacitance	$C_{in}$		$V_{in} = 0$	-	-	-	5.0	7.5	-	-	pF
Quiescent Current	$I_{DD}$	5.0	Zero Signal, per Package	-	20	-	0.005	20	-	150	$\mu$ A
		10		-	40	-	0.010	40	-	300	
		15		-	80	-	0.015	80	-	600	
Total Supply Current *	$I_T$	5.0	Dynamic $+I_{DD}$ , per Gate, $C_i = 50$ pF $f = 1$ kHz	-	-	-	1.1	-	-	-	$\mu$ A
		10		-	-	-	2.3	-	-	-	
		15		-	-	-	3.7	-	-	-	

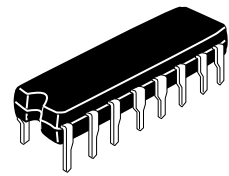
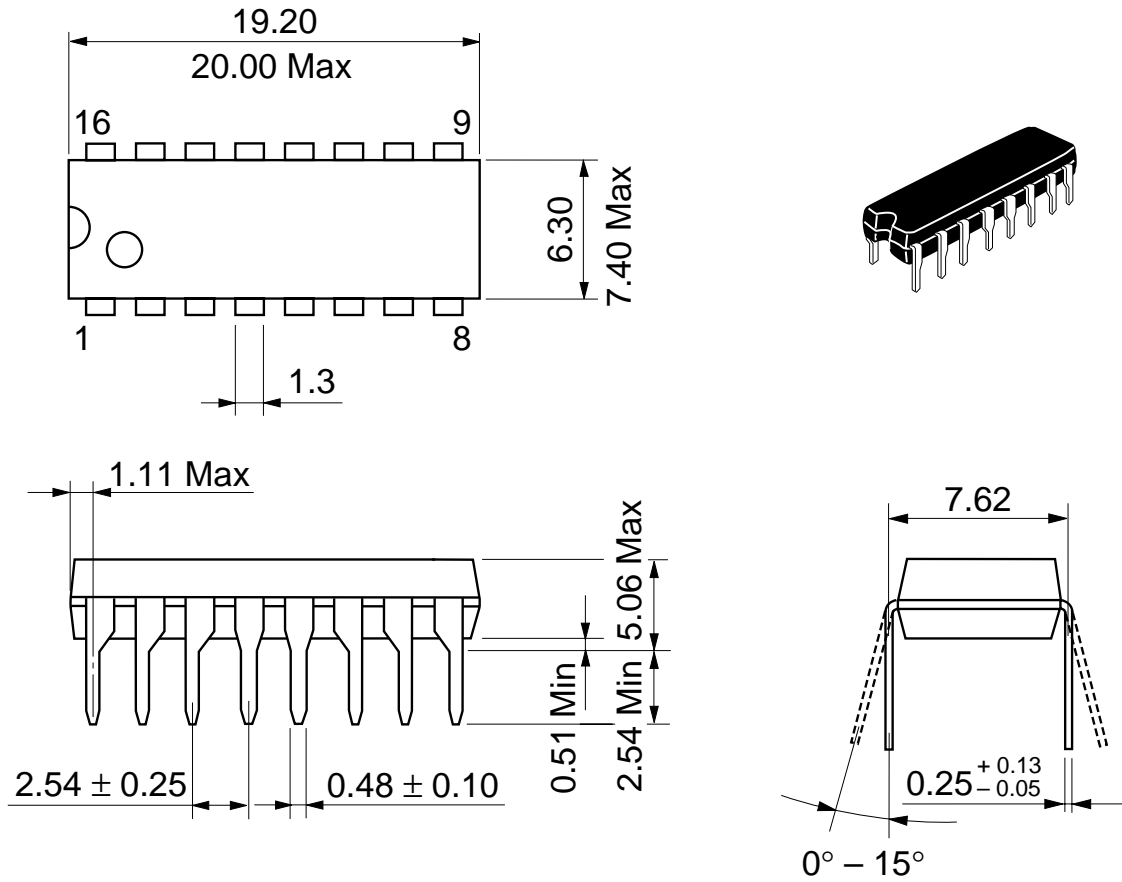
\* To calculate total supply current at frequency other than 1kHz.  
 @  $V_{DD} = 5.0$  V  $I_T = (1.1 \mu A/kHz)f + I_{DD}$  @  $V_{DD} = 10$  V  $I_T = (2.3 \mu A/kHz)f + I_{DD}$  @  $V_{DD} = 15$  V  $I_T = (3.7 \mu A/kHz)f + I_{DD}$

**SWITCHING CHARACTERISTICS** ( $C_L = 50\text{pF}$ ,  $T_a = 25^\circ\text{C}$ )

Characteristic		Symbol	$V_{DD}$ (V)	min	typ	max	Unit
Output Rise and Fall Time		$t_r, t_f$	5.0	—	100	200	ns
			10	—	50	100	
			15	—	40	80	
Propagation Delay Time	Clock	$t_{PLH}, t_{PHL}$	5.0	—	210	420	ns
			10	—	85	170	
			15	—	65	130	
	Reset	$t_{PHL}$	5.0	—	250	500	ns
			10	—	100	200	
			15	—	75	150	
Clock Pulse Width		$PW_C$	5.0	150	75	—	ns
			10	90	45	—	
			15	70	35	—	
Reset Pulse Width		$PW_R$	5.0	200	100	—	ns
			10	100	50	—	
			15	80	40	—	
Clock Frequency		$PRF$	5.0	—	7.0	2.0	MHz
			10	—	12.0	5.0	
			15	—	15.5	6.5	
Clock Pulse Rise and Fall Time		$t_r, t_f$	5.0	—	—	15	$\mu\text{s}$
			10	—	—	15	
			15	—	—	15	
Setup Time		$t_{setup}$	5.0	40	20	—	ns
			10	20	10	—	
			15	15	0	—	
Hold Time		$t_{hold}$	5.0	80	40	—	ns
			10	40	20	—	
			15	30	15	—	
Reset Removal Time		$t_{rem}$	5.0	250	125	—	ns
			10	100	50	—	
			15	80	40	—	

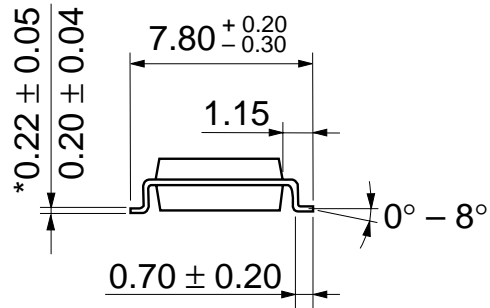
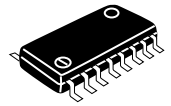
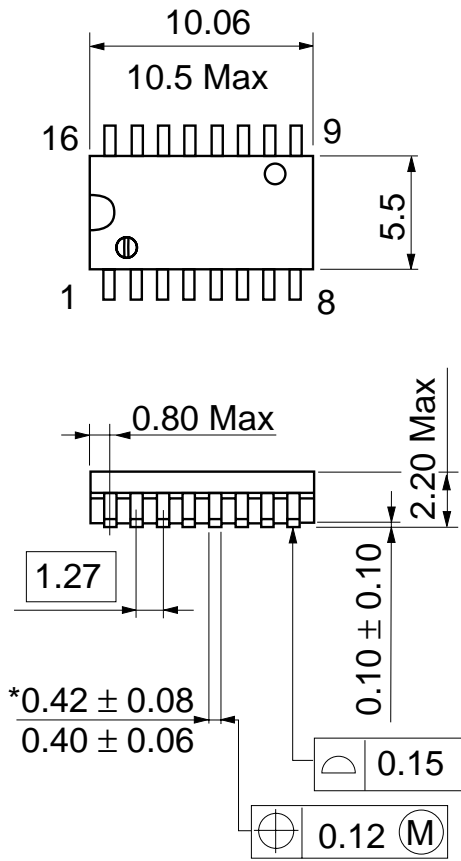
\* The reset signal must be high prior to a positive-going transition of the clock.

Unit: mm



Hitachi Code	DP-16
JEDEC	Conforms
EIAJ	Conforms
Weight (reference value)	1.07 g

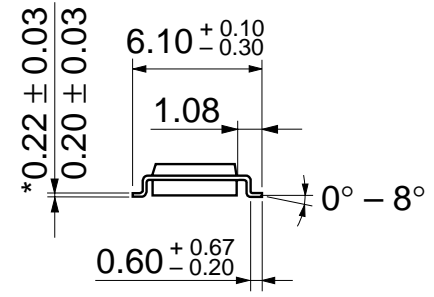
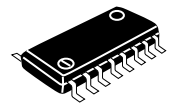
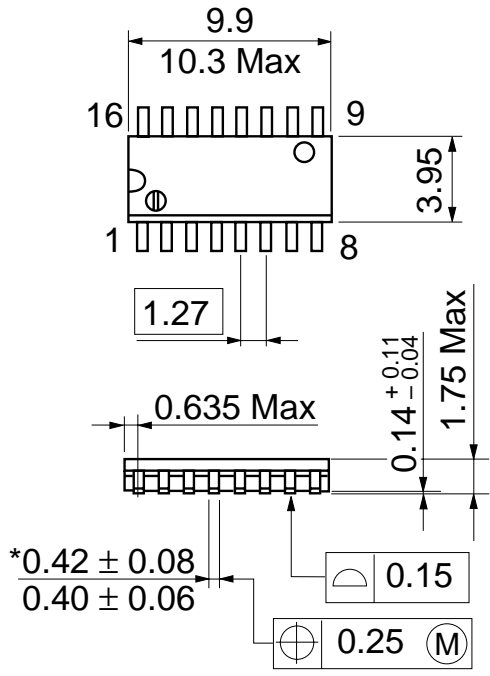
Unit: mm



\*Dimension including the plating thickness  
 Base material dimension

Hitachi Code	FP-16DA
JEDEC	—
EIAJ	Conforms
Weight (reference value)	0.24 g

Unit: mm



\*Dimension including the plating thickness  
 Base material dimension

Hitachi Code	FP-16DN
JEDEC	Conforms
EIAJ	Conforms
Weight (reference value)	0.15 g

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